

# AMATEUR SATELLITE REPORT

AMSAT® NA Newsletter for the Amateur Radio Space Program



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**Editor:** Vern Riportella, WA2LQQ  
**Managing Editor:** Bob Myers, W1XT

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## **Phase 3C Poised For launch**

All is in readiness for the launch of AMSAT's Phase 3C satellite in the first week of June. The fueling operation of the joint AMSAT-NA and AMSAT-DL teams was completed without incident and the spacecraft stands ready for launch as soon as the launcher itself is ready. With the fueling complete, the spacecraft sits ready to be stacked with the other payloads Meteosat P2 and PANAMSAT on the huge Ariane 4 launcher.

Sources indicate June 7 or June 8 are the most likely launch dates. The actual launch date will firm when the next launch, that of an Intelsat spacecraft on the V-23, has been accomplished. That launch is currently slated for May 17 or 18. If the launch of Phase 3C on mission V-22 does occur on or about June 7 as now planned, the launch window will be about 1200 UTC which is morning in Kourou, French Guiana, the launch facility of the European Space Agency.

Returning to the U.S. from Kourou in late April, AMSAT-NA's Team 2 crew chief Dick Daniels, W4PUJ, reports the fueling operation went perfectly with no anomalies whatsoever. There was no repeat of the Phase 3B incident when safety observers detected minute propellant gas accumulation around the spacecraft. That was determined to be slight permeation through some Teflon tubing. That tubing has not been used on Phase 3C. The new design, including a complete re-design of the valve and plumbing system is working perfectly. Monitoring of the spacecraft telemetry which is a major task of Team 3, will continue through until launch day.

Phase 3C will be placed into general operation not earlier than about one month after launch depending on the number and timing of on-orbit kick motor burns implemented.

## **Transpolar Skitrek Progress Report #13: April 23, 1988**

Although closing in on the North Pole now, the joint Canadian-Russian Skitrek team is hardly "out of the woods", figuratively speaking, for they are currently encountering some of their most difficult trekking yet as they come within 60 km of the pole. Their arrival is planned for Monday, April 25, although heavy winds and cold temperatures may impede them. A major press conference including interviews and radio demonstrations is planned for Tuesday, April 26.

Up to 100 dignitaries will be arriving from Moscow and Ottawa along with members of the press to greet the skiers as they pass this important milestone. A 24 hour DXpedition special event station is being set up on the ice to be operated by the Russian and Canadian communications support team on April 26th. Barry (4KØDX/VE3CDX) and Leo (EXØCR) will be the main operators with others, perhaps the skier hams as well, joining in. Operations will take place on 20 meters on 14.182 and 14.121 MHz. Operations on RS-11 will have a downlink around 29.430. Demonstrations of HF, VHF and satellite communications will be given to the press.

As they approached the Pole, the skiers sent a number of interesting messages south that revealed something of their life on the ice. A message of April 17th from Dr. Maxwell Buxton, the expedition's Canadian doctor, is typical. He said, in part:

"We have been on the ice 45 days now and are ready to begin our final assault on the Pole. The journey has been divided into two week stages.... Every stage has had its unique problems and solutions, but as we progress I think we all feel that things are getting better. The weather

has warmed from a bone chilling -48 degrees Celsius to the present balmy -25 degrees. In our minds the mood has shifted from apprehension, somber internalization and concern with survival to optimization, conviviality and a sense of accomplishment. Almost 1000 km remain before our goal is realized, but with the Pole just over 200 km away we are feeling spunkier than at any point to date. For the Canadian members, the trip now presents (an opportunity for thoughts) of home, our families and friends. For all of us, we have, in fact, reaffirmed our love for them and for the homeland."

Some 10 thousand miles to the south and east in Napier, New Zealand, Lorraine Stevenson and Ruth Hallam have been sharing the Transpolar Skitrek Expedition with their students, ages 5 to 9 years. With the aid of David Lamont, ZL2AMD, the students have received the UO-11 Digitalker, plotted the Trek's progress, and discussed and simulated the skiers' journey.

Lorraine reports, "For kids who have not experienced snow or cold to any degree, their interest and understanding of the problems of ice drift, cold, hardship being faced, is remarkable. We packed a back pack with wooden blocks to see how hard it would be to carry. We practice our skiing by putting (our) feet on long blocks and scooting around the room." Shayne Westerlaken, a six year old student of Lorraine's, told us in a separate letter that the pack "was very heavy. I couldn't stand up!"

Meanwhile, on the Soviet Ice Island North Pole 28 not far from the Pole, Barry Garratt (4KØDX) is getting a real exposure to arctic unpredictability. This past Thursday a large lead opened up in the ice of the ice island just two meters from the front door of the radio shack. As the 40 and 80 meter antennas drifted away from the shack, co-ax had to be cut. The 40 meter antenna was salvaged and both it and a new 80 meter antenna have been erected. Communications with the skiers was not disrupted by this startling event. The airstrip was on the separated section. Barry reported Saturday that the lead was freezing over and that the situation at NP 28 was stable.

A special demonstration message will be loaded on UoSAT OSCAR 11 beginning Monday, April 25 for the press conference the next day, Tuesday. The message may be monitored on the usual UO-11 2 meter downlink of 145.825 MHz. Meanwhile, the UoSAT Nordski Project Manager, Mike Meerman, PA3BHF, has been invited by the Russians to attend the press conference at the North Pole Tuesday. He was said to be scrambling about trying to arrange a visa for the short trip.

## **Skitrek Progress Report #14: April 30, 1988**

The Amateur Radio supported Transpolar Skitrek got underway on April 28th after an event filled 2 day stay at the North Pole. Media coverage increased as Russian TV, the Cable News Network and CBC-TV covered activities at the Pole. As of April 30th, the skiers were at 89d 37.9m N and 94d 29.8m W. During the Trek the UO-11 Digitalker has been steadily reporting the "moving groups" position. The buzzing sound heard alternating with the Digitalker is the digital data which encoded the latest bulletin from the University of Surrey. The digital data carries telemetry as its other major function but this was temporarily suspended during the special program established for the press conference. Here is bulletin #132, as transmitted by UO-11 dated April 28:

## **UoS Team Member Joins Skitrek at North Pole**

The joint Canadian-Soviet SkiTrek reached the North Pole on 26th April 1988, 54 days and 1000 km after setting out on their "Transpolar Ski-Trek."



Since departing from northern USSR on 1 March, the team has received daily progress updates of their exact location from the UoSAT-2 DIGITALKER.

Arrival at the North Pole marks the half way point in the 2000 km trek from Cape Arktichesky on the Severnaya Zemlya archipelago, USSR, to the Cape of Columbia on Ellesmere Island, Canada. The team was joined at the Pole by journalists from around the world — flown in to a unique North Pole press conference. In recognition of the assistance that UoSAT-2 continues to provide for the skiers, Michael Meerman (GØ/PA3BHF), member of the University of Surrey's UoSAT Spacecraft Engineering Research Unit, was invited by the Soviet Ski-Trek leader to attend the press conference at the North Pole. Michael is the UoSAT Team member in charge of the daily operation of both UoSATS, and has been responsible for loading the Ski-Trek reports to UoSAT-2.

Michael travelled to Moscow on 24 May, and travelled from there to Sredney Island on the 25th. From Sredney, he made contact with G3YJO at UoS via 20-meter SSB. On the 26th after some delays caused by bad weather, Michael arrived at the pole, where he was able to interview members of the Ski-Trek team.

Thousands of school children throughout the world have been tracking the skiers by listening to the UoSAT-2 DIGITALKER, and learning about polar exploration through weekly Ski-Trek updates authored by AMSAT-NA member Rich Ensign (N8IWJ). Michael Meerman carried a list of their questions with him to the pole, to get the answers directly from the skiers themselves.

As the Ski-Trek continues towards its final destination in Canada, UoSAT-2 will also continue to provide daily position updates, demonstrating the value of the UoSAT OSCAR satellites to education and polar communications.

## Digitalker on UoSAT-1

Many of those listening to the Ski-Trek DIGITALKER reports will be interested to know that the UoSAT OSCAR 9 spacecraft (UoSAT-1) also carries a DIGITALKER, which is activated every week. From 0000 to 1500 GMT on Thursdays, the UoSAT-1 DIGITALKER "speaks" spacecraft telemetry values in plain language. The best UoSAT-1 passes usually occur around 8 or 9 o'clock local time each morning and evening. Pass this information on to those who have only been listening to UoSAT-2, but would like to try more experimentation with satellites.

## Send Activity Reports

As always, we at UoS are interested to hear what you are doing with the UoSAT satellites. If you have been using the DIGITALKER to follow the SkiTrek, please send us (address above) a brief description of your activity.

You can send reports to UoS through amateur packet radio if you are in the UK, Australia, New Zealand, South Africa or the USA. Just address your messages so that they will be forwarded to your local UoSAT-2 DCE gateway station.

This report has been prepared by Rich Ensign, N8IWJ, AMSAT Science Education Advisor For Use With The AMSAT Teachers Guide "Exploring The High Arctic From Your Classroom". These reports may be regularly accessed on the AMSAT WØRPK bulletin board by calling 1-515-961-3325.

## Record Crowds Flood Dayton Hamvention

Early reports suggest record crowds have made the 1988 Dayton Hamvention the largest in history. Reports are circulating that upwards of 30,000 attended by Saturday, April 30. If so, this would be at least 20% above the previous high attendance mark of 25,000.

Traffic at the AMSAT booth was brisk throughout the weekend. Interest in Phase 3C was high and a significant proportion of visitors were well familiar with the progress towards launch of the new satellite. Questions concerning suitable equipment for Phase 3C and where to find it predominated the discussions at the booth.

Doug Loughmiller, KO5I, led a team of AMSAT volunteers working the double booth. The new AMSAT Phase 3C poster was on display for the first time. The booth also included a strong TAPR contingent.

AMSAT held two forums over the weekend. The Saturday forum moderated by KO5I featured Jan King, W3GEY who spoke on Phase 3C progress, Phase 4 and PACSAT. Vern Riportella, WA2LQQ, gave a presentation on future projects and Garth Hamilton, VE3HO, gave an update on the SKITREK project. On Sunday, Bill Tynan, W3XO, spoke on upcoming manned space activities; Tom Clark, W3IWI and Bob McGwier, N4HY,

spoke on PACSAT, Amateur Radio's next packet satellite. Excellent attendance was reported at both AMSAT forums.

Member renewals were strong suggesting interest levels are increasing with the approach of the Phase 3C launch. New and renewing members totaled 152 memberships according to KO5I. Receipts of over \$11,000 also represented an all-time high AMSAT HQ said. Field Ops Vice President Loughmiller characterized the event a "complete success" and congratulated those supporting in the AMSAT booth for their excellent work. Booth workers included W5IU, W8JLE, K9PVW, K8QKY, WB9FLW, WØSL, W3IWI, N4HY, WA2LQQ, W3GEY and more. (List incomplete at press time.) The new Phase 3C poster (available from AMSAT HQ for only \$7.50 plus \$1 postage and handling) debuted and was seen in several booths around the arena having been placed there by satellite enthusiast-booth operators.

Equipment suitable for Phase 3C was much in evidence with some entries present even for Mode S. Downeast Microwave, Spectrum International, PX Shack and Microwave Modules were among those offering off-the-shelf equipment for 24 and 13 cm. The auto-tracking interface called the "Kansas City Tracker" which works with the IBM series of computers was also on display as was the Mirage autotracking system.

Foreign AMSAT dignitaries present included Brasil AMSAT President Junior DeCastro, PY2BJO, AMSAT-LU President Carlos Huertas, LU1ENQ and AMSAT-LU First Vice President Arturo Carou, LU1AHC.

## Editorial Comment

Near-perfect weather and a very upbeat crowd at Dayton's Hara Arena punctuated the generally optimistic feeling which seemed very much in evidence. This is in contrast to some years in which a general pall hung over the event for reasons which remain unclear. In this year's event, however, there was a good feeling about the overall event and both attendees and vendors seemed to reflect a generally buoyant atmosphere. This optimism was very much in evidence at the AMSAT booth which stayed pleasantly crowded virtually from the opening bell and throughout the weekend.

The annual spectacle which is the Dayton Hamvention is again history. Amateur Radio enthusiasts (some would say masochists) from the world over descended on this southwestern Ohio town and turned it, if for only a weekend, into the ham radio capital of the universe.

This event is truly astounding in its proportions. The air literally becomes electric. But this is not totally due to the simultaneous presence of upwards of 30,000 hams and almost as many HTs, but perhaps is more attributable to the "envelope stretching" which goes on one weekend a year in Dayton. There are more hams packed on one twelve acre site, more towers, more antennas, more radios, more hucksters, more junk, more prizes and more money than just about anywhere else you can name. New products which are worth debuting typically debut at Dayton. Companies which duck other conventions surface at Dayton. "If you do one event per year, you do Dayton," they typically say.

The Dayton Hamvention is more like a city than a convention. Like a city, it embodies the best and the worst of the larger society. You find the best of Amateur Radio's leadership and the sleaziest of "scheisters" elbow to elbow plying the corridors. You find genuinely good people and plain crooks in adjacent booths ready to help you or ready to relieve you of your wallet. The "smell of greasepaint, the roar of the crowd" could just as well have been written of the circus which is the Dayton Hamvention each spring.

Within this melee AMSAT again established its usual all-stops-out presence. Despite the circus-like atmosphere (perhaps, some say because of it!), the Dayton Hamvention remains the center of the Amateur Radio universe insofar as major convocations are concerned. AMSAT and scores of AMSAT members were on hand to insure it lived up to the "Best" end of the billing spectrum. AMSAT is grateful for the tremendous support forthcoming from member-attendees and new members and to the excellent job performed by our crack booth crew under the able stewardship of KO5I!

## Short Bursts

- AMSAT is deeply saddened to note the passing of one of its most devoted members, Cy Williamson, VE3TW, who became a silent key in mid-April. Cy had been an active AMSAT member for many years and was a familiar voice on the AMSAT 75 meter East Coast net and his distinctive fist was easily recognized on AO-10. He will be deeply missed.



- Gordon and Molly Hardman (KE3D and N3CHZ respectively) recently became the proud parents of a lovely son Edward Ryan. Gordon is a key member of the Phase 3C and PACSAT engineering team in Boulder, Colorado.
- ASR #173 reported Weber State College in Utah had built NUSAT and stated it had been the only satellite deployed from a shuttle Getaway Special (GAS can). We should have said NUSAT was only "non-military" GAS can deployment. Rick Fleeter, WA8VVGK, of Defense Systems Incorporated (DSI) points out DSI's GLOMR, a military spacecraft, was also deployed from a GAS can. We regret the omission.
- AMSAT Belgium has been invited to participate in a large space exhibition at the Royal Army museum in Brussels. The exhibition runs from May 3 through May 29 according to Patrick Hamptaux of Chenee. Patrick is responsible for arranging a \$150 donation to the Phase 3C insurance campaign by AMSAT Belgium which AMSAT greatly appreciates.
- AMSAT is eligible to receive grants under the United Way write-in campaign whereby corporate employees whose firms support United Way fund can specify AMSAT as a beneficiary. Mattie Tynan (XYL of W3XO) recently arranged for a \$256 grant to AMSAT through the United Way. For further information on how you can help AMSAT in this way, please contact Martha at AMSAT HQ, 301-589-6062.
- Due to a clerical error, ASR #173 neglected to properly acknowledge the donation of Brasil AMSAT to the Phase 3C Insurance Fund. AMSAT-NA is grateful for the donation of \$1000 by BRAMSAT to this account.
- The Soviet Union is planning to continue its program of launching Eastern-bloc Cosmonauts to their space station, Mir. According to Radio Moscow, "The training program for the Soviet-Bulgarian space crew is drawing to an end. On 15 May we are to conduct the final comprehensive examination. The launch will take place on 7 June." A Soviet-Afghan crew is "scheduled for on August 29", Radio Moscow said.
- Radio South Africa's "Amateur Radio Spectrum" program written and produced by SA AMSAT President Hans Van de Groenendaal, ZS6AKV, is changing frequency. The program can now be heard serving UK and Europe at 18:45 UTC Saturdays on 11.875 and 15.365 MHz and serving USA and Canada at 02:45 UTC on Sundays on 6.010, 9.580 and 9.615 MHz.

## Plan AO-10 Return To Service

Planned operating times for AO-10 Mode B per ZL1AOX:

From May 14 thru May 30: MA 20 through MA 220  
 From June 01 thru June 14: MA 25 through MA 225  
 From June 15 thru June 30: MA 30 through MA 230

Please use minimum power required for communications.

## Phase 3C Info In Major Pubs

AMSAT's Phase 3C Information Campaign is off and running with articles and advertisements now appearing in the May editions of major Amateur Radio magazines. The new Phase 3C ad appears in May QST (page 138), May 73 (page 98) and May Ham Radio (Page 46). Articles in 73 include fine pieces by Courtney Duncan, N5BF; Bob Diersing, N5AHD; Chuck Towns, K6LFH and Heather MacAllister, WA5RMA. These are in addition to Andy MacAllister's, WA5ZIB, fine regular 73 column. Quite a coup for 73 magazine with its "Super Satellite Issue!" The articles were coordinated by Project Leader Andy MacAllister, WA5ZIB.

The June QST's cover story will be dedicated to Phase 3C and several authors are cranking out more Phase 3C articles to help get the word out on how to use the new satellite. Watch for their work in the major publications soon.

## UoSAT OSCAR 11 DCE and Third Party Traffic

by Jeff W. Ward GØ/K8KA  
 UoSAT Spacecraft Engineering Research Unit.

Since early 1986, the Digital Communications Experiment (DCE) onboard the UoSAT OSCAR 11 satellite has been available to a network of Amateur Radio "gateway" stations for use as a long distance digital message forwarding channel. The network of active gateway stations has been steadily

increasing, and the UK gateway alone has handled 1 Mbyte of messages so far this year.

As the first continuously available Amateur Radio "PACSAT" service, the DCE has also been the first to come up against the international regulations which effect the flow of packet radio messages. In particular, strict third-party traffic regulations in the USA made it impossible to forward messages to or from the UK through the USA packet network.

To overcome this problem, UoSAT team members Jeff Ward (GØK8KA) and Martin Sweeting (G3YJO) contacted the UK Department of Trade and Industry (DTI). This is the government department regulating Amateur Radio in the UK. The DTI recognized the UoSAT-2 DCE as an important experiment and they were willing help solve the USA third-party traffic problem.

The solution was simple: the USA has a limited third party traffic agreement with the UK. The agreement covers messages passed by UK stations using callsign prefix "GB", except those with prefix "GB3". Since the PBBS at UoSAT has the callsign GB3UP, its messages were not legal under the existing agreement. To solve this problem, the DCE groundstation at the University of Surrey was granted the callsign GB2UP. Messages passed to and from GB2UP come within the third party agreement between the USA and the UK. Thus, messages received by the US packet network from the UK via GB2UP and the DCE have travelled via a legitimate international link.

With recent reactivation of the DCE gateway station run by K1KSY (John Biro) and the expected activation of a station on the west coast of the USA, the UoSAT group feels it should be known by PBBS operators in the USA that messages from the UK via the DCE are not illegal third party traffic. These messages can be easily identified, since they have GB2UP as an intermediate PBBS in their forwarding headers.

Individual USA gateway station operators will determine how messages should be routed to the UoSAT OSCAR 11 DCE, and how one can indicate your messages are bound for this authorized international link.

With use of the UoSAT OSCAR 11 DCE increasing, and FO-12 and Phase 3C also able to provide international packet message forwarding, we must be careful to distinguish acceptable international traffic from that which should be suppressed. Simply killing all messages containing foreign calls will be "throwing the baby out with the bath water."

## FO-12 Sked

JARL has announced the following FO-12 operating schedule.

Mode	From	(UTC)	
JA	May 14	0633	JA = Analog mode
D	16	0647	JD = Digital mode
JA	18	0459	D = All systems off
D	19	0607	DI = Systems off except CPU and memory
JA	21	0620	
D	23	0432	
JA	25	0446	
D	26	0352	
JD*	27	0500	* Note: On 27 May a special telemetry format will be employed using a 2-second acquisition cycle. The mailbox will be inoperative during this period. Send reports on FO-12 mailbox to JARL (JJ1ZUT).
JD	28	1016	
D	May 30	0217	
JD	Jun 04	0353	
DI	05	0259	
JD	07	0110	
DI	08	0218	
JD	11	0546	
DI	12	0654	
JD	14	0505	
DI	15	0613	
JD	18	0533	
D	19	0439	
JA	22	0156	
D	23	0304	
JA	25	0318	
D	27	0131	
JA	29	0143	
D	Jun 30	0049	

The transponders will be off at other times. The actual operating schedule may change due to unexpected situations such as variations in available power.



**Satellite**  
 Catalog number 12888  
 Epoch time: 88115.55230171  
 Element set: 195  
 Inclination: 97.6185 deg  
 RA of node: 146.8773 deg  
 Eccentricity: 0.0003261  
 Arg of perigee: 154.4439 deg  
 Mean anomaly: 205.7064 deg  
 Mean motion: 15.32488895 rev/day  
 Decay rate: 1.0208e-04 rev/day<sup>2</sup>  
 Epoch rev: 36452

**Satellite**  
 Catalog number 14129  
 Epoch time: 88109.14155630  
 Element set: 336  
 Inclination: 27.3715 deg  
 RA of node: 328.0758 deg  
 Eccentricity: 0.6028179  
 Arg of perigee: 297.3173 deg  
 Mean anomaly: 14.4097 deg  
 Mean motion: 2.05882072 rev/day  
 Decay rate: -1.81e-06 rev/day<sup>2</sup>  
 Epoch rev: 3646

**Satellite**  
 Catalog number 14781  
 Epoch time: 88104.24874652  
 Element set: 307  
 Inclination: 98.0577 deg  
 RA of node: 168.5776 deg  
 Eccentricity: 0.0012038  
 Arg of perigee: 232.6220 deg  
 Mean anomaly: 127.3870 deg  
 Mean motion: 14.62274074 rev/day  
 Decay rate: 4.78e-06 rev/day<sup>2</sup>  
 Epoch rev: 21969

**Satellite**  
 Catalog number 16909  
 Epoch time: 88104.26260007  
 Element set: 91  
 Inclination: 50.0148 deg  
 RA of node: 179.8548 deg  
 Eccentricity: 0.0011415  
 Arg of perigee: 332.1841 deg  
 Mean anomaly: 27.8318 deg  
 Mean motion: 12.44394839 rev/day  
 Decay rate: -2.5e-07 rev/day<sup>2</sup>  
 Epoch rev: 7587

**Satellite**  
 Catalog number 18129  
 Epoch time: 88116.79137287  
 Element set: 356  
 Inclination: 82.9287 deg  
 RA of node: 186.4378 deg  
 Eccentricity: 0.0013095  
 Arg of perigee: 125.1955 deg  
 Mean anomaly: 235.0455 deg  
 Mean motion: 13.71893227 rev/day  
 Decay rate: 2.3e-07 rev/day<sup>2</sup>  
 Epoch rev: 4216

**Satellite**  
 Catalog number 16735  
 Epoch time: 88112.26211763  
 Element set: 229  
 Inclination: 82.5376 deg  
 RA of node: 221.7810 deg  
 Eccentricity: 0.0015960  
 Arg of perigee: 112.6303 deg  
 Mean anomaly: 247.6550 deg  
 Mean motion: 13.83778012 rev/day  
 Decay rate: 5.2e-07 rev/day<sup>2</sup>  
 Epoch rev: 9610

**Satellite**  
 Catalog number 17290  
 Epoch time: 88113.00005820  
 Element set: 161  
 Inclination: 82.4635 deg  
 RA of node: 131.5757 deg  
 Eccentricity: 0.0013660  
 Arg of perigee: 9.7147 deg  
 Mean anomaly: 350.4306 deg  
 Mean motion: 13.83586681 rev/day  
 Decay rate: 6.4e-07 rev/day<sup>2</sup>  
 Epoch rev: 6537

**Satellite**  
 Catalog number 18312  
 Epoch time: 88112.67514177  
 Element set: 100  
 Inclination: 82.5605 deg  
 RA of node: 193.4670 deg  
 Eccentricity: 0.0011454  
 Arg of perigee: 305.9833 deg  
 Mean anomaly: 54.0246 deg  
 Mean motion: 13.83343994 rev/day  
 Decay rate: 1.06e-06 rev/day<sup>2</sup>  
 Epoch rev: 3423

**Satellite**  
 Catalog number 18820  
 Epoch time: 88113.00573830  
 Element set: 27  
 Inclination: 82.5383 deg  
 RA of node: 255.1865 deg  
 Eccentricity: 0.0017126  
 Arg of perigee: 18.1810 deg  
 Mean anomaly: 341.9934 deg  
 Mean motion: 13.84021640 rev/day  
 Decay rate: 5.0e-07 rev/day<sup>2</sup>  
 Epoch rev: 1142

**Satellite**  
 Catalog number 16191  
 Epoch time: 88112.68955186  
 Element set: 750  
 Inclination: 82.5528 deg  
 RA of node: 173.7861 deg  
 Eccentricity: 0.0019015  
 Arg of perigee: 275.5972 deg  
 Mean anomaly: 84.2980 deg  
 Mean motion: 13.16926980 rev/day  
 Decay rate: 4.3e-07 rev/day<sup>2</sup>  
 Epoch rev: 12004

**Satellite**  
 Catalog number 15427  
 Epoch time: 88111.51694677  
 Element set: 255  
 Inclination: 99.0957 deg  
 RA of node: 85.4884 deg  
 Eccentricity: 0.0016586  
 Arg of perigee: 61.5245 deg  
 Mean anomaly: 298.7577 deg  
 Mean motion: 14.11575675 rev/day  
 Decay rate: 2.2e-07 rev/day<sup>2</sup>  
 Epoch rev: 17281

**Satellite**  
 Catalog number 16969  
 Epoch time: 88111.55831107  
 Element set: 141  
 Inclination: 98.6800 deg  
 RA of node: 143.1893 deg  
 Eccentricity: 0.0014688  
 Arg of perigee: 39.3200 deg  
 Mean anomaly: 320.9042 deg  
 Mean motion: 14.22563660 rev/day  
 Decay rate: 1.71e-06 rev/day<sup>2</sup>  
 Epoch rev: 8258

**Satellite**  
 Catalog number 16609  
 Epoch time: 88116.84871577  
 Element set: 167  
 Inclination: 51.6245 deg  
 RA of node: 336.3717 deg  
 Eccentricity: 0.0022401  
 Arg of perigee: 254.0035 deg  
 Mean anomaly: 105.8299 deg  
 Mean motion: 15.74635553 rev/day  
 Decay rate: 1.39622e-03 rev/day<sup>2</sup>  
 Epoch rev: 12558

**Satellite**  
 Catalog number 13138  
 Epoch time: 88116.83139107  
 Element set: 63  
 Inclination: 51.6153 deg  
 RA of node: 182.5538 deg  
 Eccentricity: 0.0000544  
 Arg of perigee: 325.7086 deg  
 Mean anomaly: 34.3938 deg  
 Mean motion: 15.32535899 rev/day  
 Decay rate: 5.672e-05 rev/day<sup>2</sup>  
 Epoch rev: 34405

**Satellite**  
 Catalog number 16908  
 Epoch time: 88031.10652162  
 Element set: 72  
 Inclination: 50.0054 deg  
 RA of node: 44.6150 deg  
 Eccentricity: 0.0011678  
 Arg of perigee: 147.3848 deg  
 Mean anomaly: 212.7709 deg  
 Mean motion: 12.44369984 rev/day  
 Decay rate: -2.5e-07 rev/day<sup>2</sup>  
 Epoch rev: 6677

## AMSAT® NA

The Radio Amateur Satellite Corporation

Post Office Box 27  
 Washington, DC 20044  
 (301) 589-6062



Martha Saragovitz, AMSAT's Director of Administration, recently completed her tenth year as an AMSAT employee. She has worked for AMSAT for more than half of its corporate life. Recently, she was awarded the plaque seen here and commended by the Board of Directors at its Spring meeting in March.

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